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NASA-16435 (June 2004)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA

Superseding NASA-16435 (March 2003)

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AUTOMATIC TRANSFER SWITCHES

06/04

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SECTION 16435

AUTOMATIC TRANSFER SWITCHES

06/04

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers automatic transfer switches for use with engine-generator sets for standby power.

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PART 1 GENERAL

1.1 REFERENCES

****

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

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The publications listed below form a part of this section to the extent referenced:

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2003) Enclosures for Electric Equipment (1000 Volts Maximum)
NEMA ICS 1	(2000) Industrial Control and Systems: General Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1008	(2003) Automatic Transfer Switches
UL 508	(2003) UL Standard for Safety Industrial Control Equipment

1.2 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.
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The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Connection diagrams shall be submitted showing the relations and connections of the following items by showing the general physical layout of all controls, the interconnection of one system (or portion of system) with another, and internal tubing, wiring, and other devices.

Contacts
Indicating Lights
Terminal Board

Fabrication drawings shall be submitted for the following items consisting of fabrication and assembly details to be performed in the factory.

Contacts
Indicating Lights
Terminal Board
Enclosures
Accessories

Installation drawings shall be submitted for automatic transfer equipment in accordance with the paragraph entitled, "Installation," of this section.

SD-03 Product Data

Equipment and Performance Data shall be submitted for automatic transfer equipment in accordance with paragraph entitled, "General Requirements," of this section.

Manufacturer's catalog data shall be submitted for the following items:

Contacts
Indicating Lights
Terminal Board
Enclosures
Accessories

SD-06 Test Reports

Test reports for Operation Tests shall be submitted on the automatic transfer switch in accordance with the paragraph entitled, "Field Testing," of this section.

SD-07 Certificates

Listing of Product Installations for automatic transfer switches shall be submitted in accordance with paragraph entitled, "Installation," of this section.

SD-08 Manufacturer's Instructions

Manufacturer's instructions shall include special provisions required to install equipment components and system packages for Automatic Transfer Switch. Special notices shall detail impedances, hazards and safety precautions.

1.3 GENERAL REQUIREMENTS

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NOTE: If Section 16003 GENERAL ELECTRICAL PROVISIONS is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.

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Section 16003 GENERAL ELECTRICAL PROVISIONS applies to work specified in this section.

Equipment and Performance Data shall be submitted for automatic transfer equipment including life, test, system functional flows, safety features, and mechanical automated details.

1.4 QUALIFICATION TESTING

Certified independent laboratory test data for the furnished unit or an identical unit shall be provided. Tests shall meet the general use requirements of UL 508, Table 22.1. Complete automatic transfer switch shall be subjected to a test as outlined in NEMA ICS 1, paragraph 109.5. One cycle of operation tests under the UL 508 test requirements shall consist of a transfer of load from the normal source to the emergency source and retransfer to the normal source. After the required number of test cycles, the temperature rise of the contacts shall not exceed 149 degrees F. 65 degrees C. Switch operating time and sense relay pickup and dropout times shall be tested.

PART 2 PRODUCTS

2.1 APPLICATION

Automatic transfer switch shall be capable of transferring the load from the normal power source to emergency power source, and from an emergency source to the normal power source. Switch shall be located where indicated. Switch shall be solenoid-operated, mechanically held, double-throw, rated for continuous duty, capable of transferring in 100 milliseconds or less, and conforming to the applicable requirements of UL 1008 and NFPA 70, Article 700, except as herein modified. Control and

protective devices associated with automatic transfer switches shall be in accordance with Section 16286 OVERCURRENT PROTECTIVE DEVICES.

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NOTE: Show required automatic transfer switch amperage, voltage, and frequency ratings on the drawings.
****

Automatic transfer switch shall be the two-pole type for single-phase application, and three-pole type for three-phase application. A solid neutral conductor connection shall be provided for neutral transfer from normal source to emergency source.

Automatic transfer switch shall be capable of being placed in either the normal or the emergency position.

****
NOTE: Add to this specification or to the drawings the short-circuit withstand current rating of the switch based on the calculated short-circuit current available at the switch location. Sample: the switch shall withstand symmetrical three-phased short circuits of _____ amperes for a period of _____ seconds without damage.
****

2.2 CONTACTS

Main contacts shall be wiping-action silver alloy that, when rated for operation at 50 amperes or greater, shall be protected against arcing. Auxiliary contacts and control transfer relay contacts shall have a minimum continuous current rating of not less than 10-amperes inductive at 120 volts ac. The following auxiliary contacts shall be provided:

Generator-control contacts, normally open, that close on undervoltage or loss of normal power as specified, remaining closed until transfer back to normal power

Emergency-position contacts, normally open when the switch is in the normal position, that close when the switch is in the emergency position

Normal position contacts, normally closed when the switch is in the normal position, that open when the switch is in the emergency position

Auxiliary contacts shall be two-pole.

****
NOTE: Fill in automatic transfer switch mounting location, such as: on door of enclosure, remote, or mounted externally on switchgear.
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A test automatic transfer switch mounted [_____] shall be provided with contacts rated 10 amperes.

Automatic transfer switch shall be provided with overlapping neutral transfer contacts in addition to the two- or three-pole main bus contacts. Normal and emergency neutral shall be connected together only during the

transfer and retransfer operation. They shall remain connected only until the power source contacts close/open to transfer from one source to the other. Overlapping neutral transfer contacts connection time shall not exceed 100 milliseconds.

2.3 INDICATING LIGHTS

Automatic transfer switch shall be furnished with two indicating lamps. One shall light to indicate that the switch is operating on normal power, and the other shall light to indicate that the switch is operating on emergency power. Each indicating circuit shall be fused.

2.4 TERMINAL BOARD

Control devices, indicating lights, auxiliary contacts, and internal control devices or auxiliary switches, shall be internally wired to a common output terminal board. Internal functions shall be wired to facilitate remote connections or monitoring.

2.5 OPERATION

Normal source voltage across phase lines shall be monitored by sensing devices. If the normal source voltage in phase drops to 90 percent or less for a timed period, the automatic transfer switch shall start the emergency source and transfer the load to the emergency source when voltage and frequency reach rated values or, if the emergency source is on, verify voltage and frequency of the alternate source and transfer the load to the alternate source. This time period shall be field adjustable from 1 to 30 seconds. A voltage and frequency sensor relay to monitor rated values shall be provided on the emergency side to prohibit transfer until the emergency source voltage and frequency reach at least 95 percent of the required rating. Phase failure protection shall also be provided, with 65 to 70 percent drop and 92 to 95 percent voltage pickup ratings.

Automatic transfer switch shall be furnished with a time-delay feature, field adjustable from 2 to 30 minutes, that operates to delay automatic transfer back to normal power until the normal source voltage and frequency reach at least 95 percent of the rated voltage. However, if the emergency power fails, and the normal source is again available at 90 percent of the rated voltage, the time-delay circuitry shall be bypassed, and the load immediately transferred back to the normal source. Capability shall also be provided for manual transfer in either direction. Sensing relays shall operate without contact chatter or false response during voltage variations between dropout and pickup.

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NOTE: Schematic wiring diagrams must be provided on the drawings to show this feature.

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2.6 SELF-TEST CAPABILITY

Automatic transfer switch shall be provided with a control-circuit self-test feature that shall be capable of verifying the proper operation of the switch control circuit without moving the main contactor or causing discontinuity of service to the load. Self-test circuit shall have the following characteristics:

A key-operated switch that disconnects the main actuator and connects

in its place, an indicator light. Key-operated switch shall be designed to prevent removal of the key while the switch is in the self-test mode.

A power-failure simulator switch that removes voltage from the voltage-sensing devices so that emergency power activates the test light

2.7 ENCLOSURES

Automatic transfer switch enclosures shall be solid, unventilated, code-gage (14-gage, 1.9 millimeter, minimum) sheet metal, NEMA 250, Type 1, with manufacturer's standard finish.

2.8 ACCESSORIES

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NOTE: To be added when the automatic transfer switch is part of the engine-generator set.
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Automatic transfer switch shall incorporate a 24-volt solid-state, high-and low-rate charger complete with rheostat and ammeter, to maintain the engine-generator cranking batteries in a fully charged condition.

Automatic transfer switch shall incorporate an engine-generator exerciser timer to permit weekly programming of engine-generator set test runs under load.

PART 3 EXECUTION

3.1 INSTALLATION

Automatic transfer switch shall be installed as indicated, and in accordance with the manufacturer's installation instructions. Wall-mounted enclosures shall be fully aligned and installed at the indicated mounting height using a minimum of six 3/8-inch M10 bolts. Use of sheet metal screws or small machine screws will not be permitted.

Listing of Product Installations for automatic transfer switches shall be submitted showing the manufacturer has successfully manufactured automatic transfer switches of the size specified for a minimum period of 10 years. List shall include purchaser, address of installation, service organization, and date of installation.

3.2 FIELD TESTING

Automatic transfer switch shall be demonstrated to operate in accordance with the specification requirements in conjunction with the normal and emergency power sources.

-- End of Section --